Centre Number	Candidate Number

Candidate Name _____

CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Ordinary Level

COMBINED SCIENCE 5129/2

PAPER 2

OCTOBER/NOVEMBER SESSION 2002

2 hours 15 minutes

Candidates answer on the question paper.
No additional materials are required.

TIME 2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

A copy of the Periodic Table is printed on page 20.

FOR EXAMINER'S USE	
TOTAL	

This question paper consists of 19 printed pages and 1 blank page.

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

[Turn over

1 **(a)** Fig. 1.1 shows an extension-load graph for a spring.

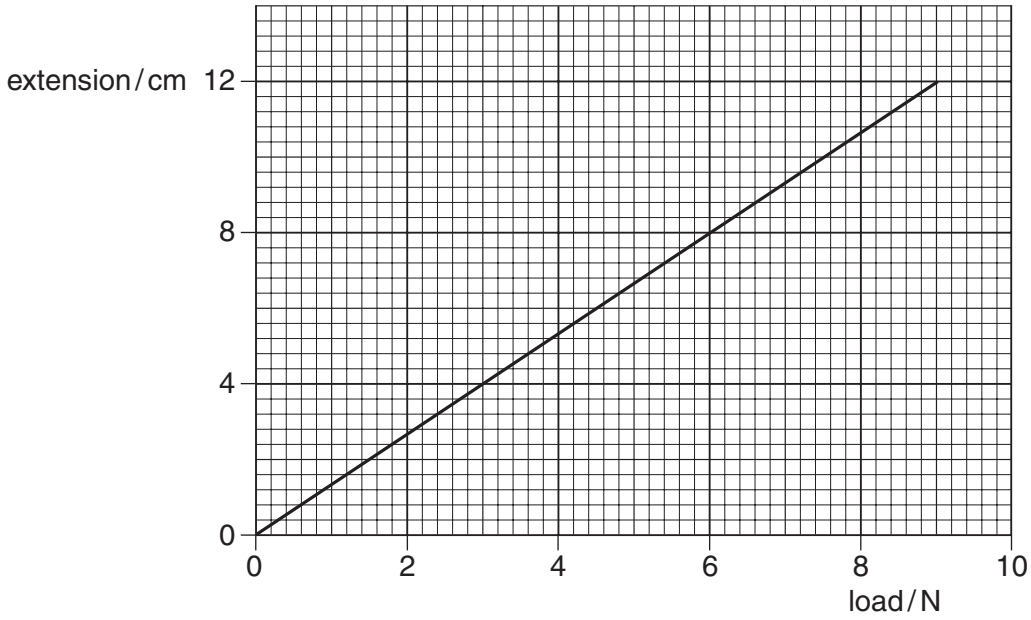

Fig. 1.1

With no force on the spring, it has a length of 10.0 cm.

What force is acting on the spring when its length is 18.0 cm?

[2]

(b) Fig. 1.2 shows the same spring being used in a device for weighing objects. The spring pulls down on one side of a wooden strip with a force of 8.0 N. The wooden strip is horizontal.

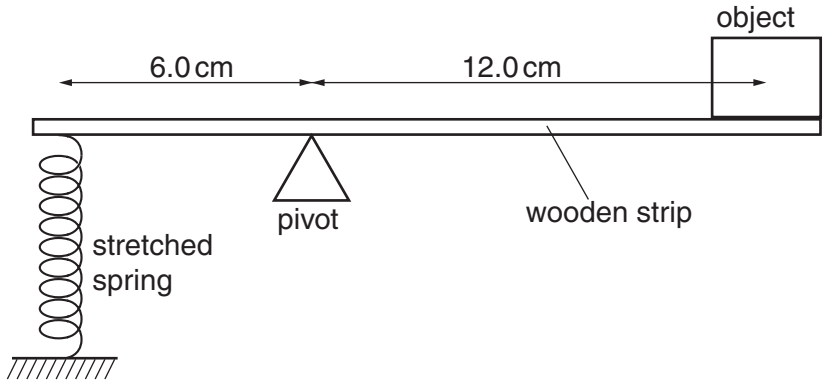

Fig. 1.2

(i) Calculate the anticlockwise moment, about the pivot, of the force in the spring.

[2]

(ii) State the clockwise moment of the weight of the object. The weight of the wooden strip can be ignored.

.....[1]

(iii) Calculate the weight of the object.

[1]

(c) Identical apparatus is used to weigh the same object on the Moon. The wooden strip is horizontal but the pivot is not in the same position as it is on Earth.

Explain why.

.....

.....

.....[2]

2 When sodium burns in chlorine, sodium chloride is produced. The structure of sodium chloride is illustrated in Fig. 2.1.

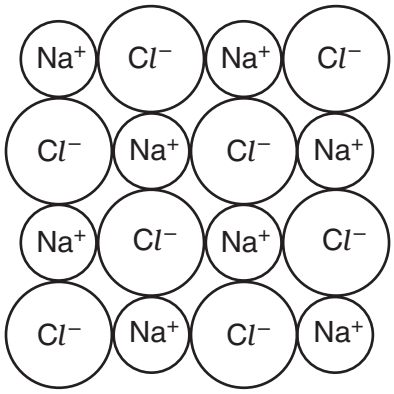

Fig. 2.1

(a) What type of bonding is present in sodium chloride?

.....[1]

(b) State the formula of sodium chloride.

.....[1]

(c) Explain why solid sodium chloride does not conduct electricity.

.....

.....[1]

(d) Suggest the names of an acid and an alkali that react together to form sodium chloride.

.....

.....[2]

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PLEASE TURN OVER
FOR QUESTION 3

3 Fig. 3.1 shows the apparatus used to investigate how the rate of photosynthesis varies with light intensity.

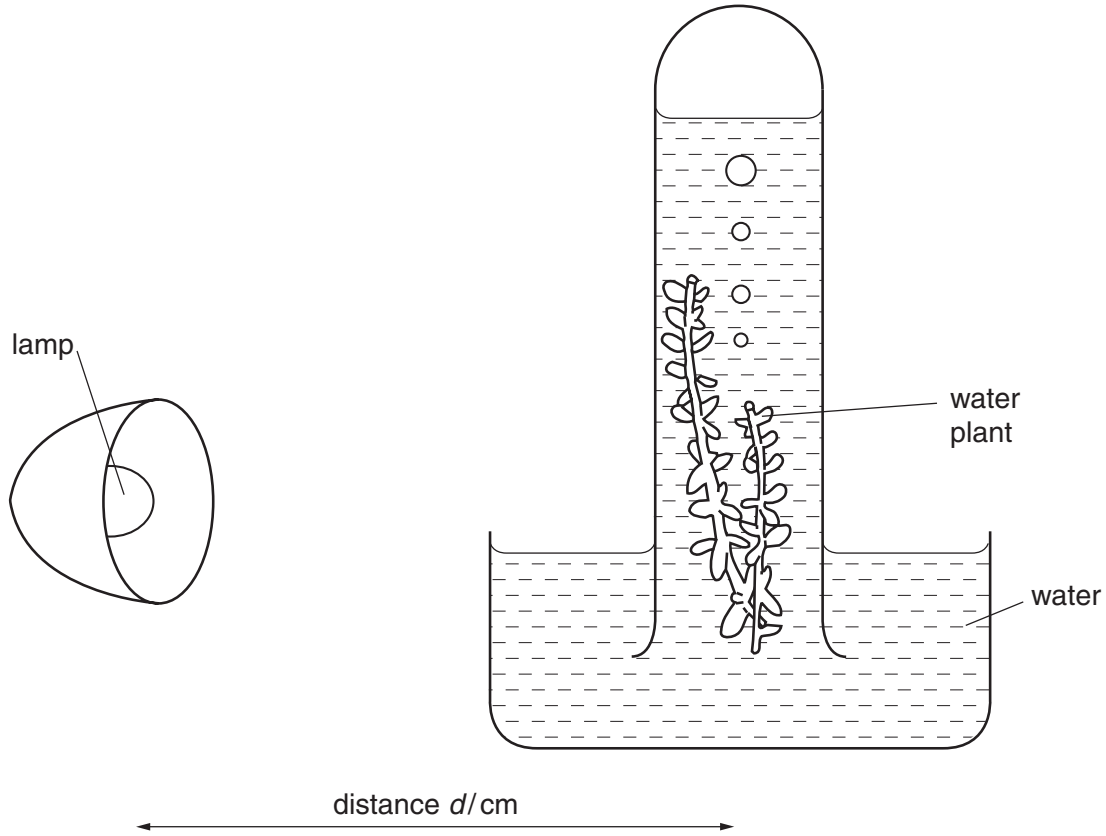


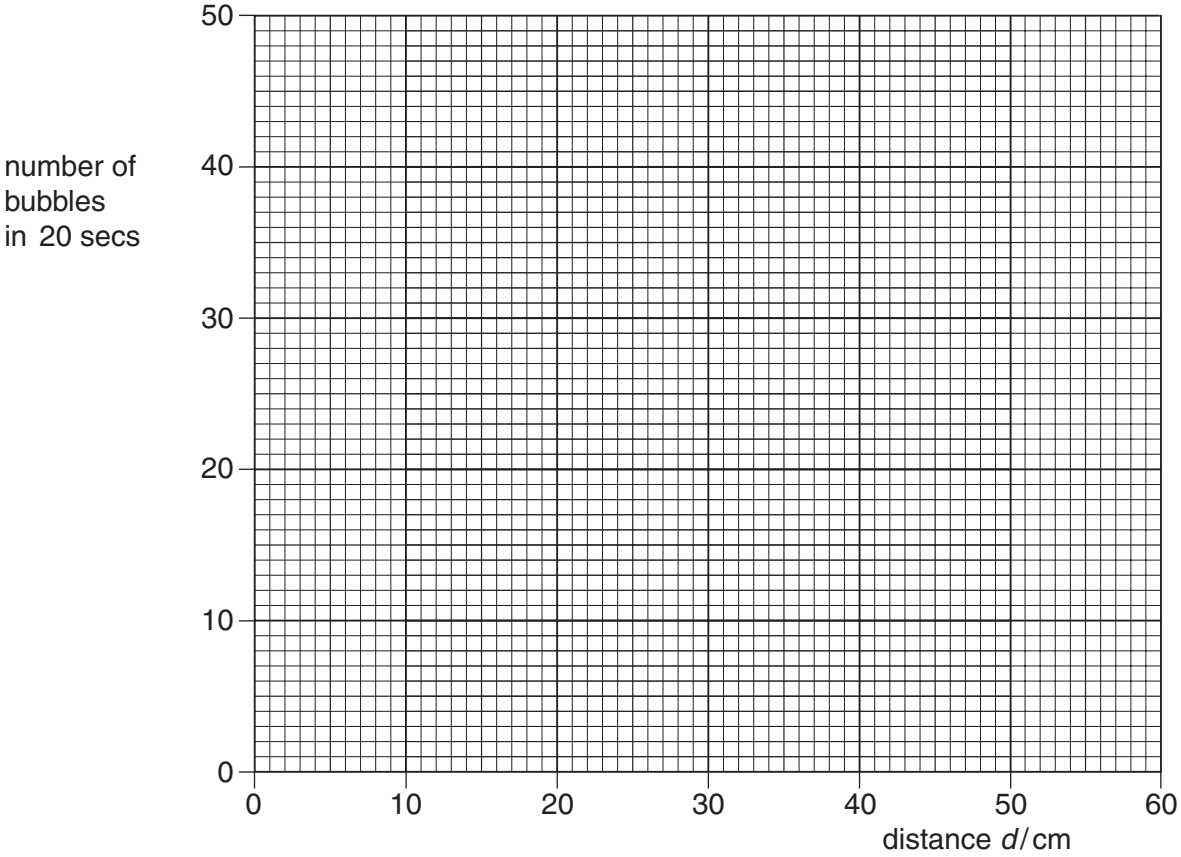
Fig. 3.1

Bubbles of gas are given off as the plant photosynthesises.
The number of bubbles given off in a time of 20 seconds is counted.
The distance *d*, between the lamp and the plant, is changed and the experiment is repeated.

Fig. 3.2 shows the results of the investigation.

distance *d* / cm	number of bubbles in 20 seconds
5	40
10	25
15	20
20	15
25	10
30	8
35	5
40	2
50	1

Fig. 3.2



(a) Name the gas in the bubbles.

.....[1]

(b) Plot the data in Fig. 3.2 on the grid above. [3]

(c) How does the rate of photosynthesis vary with increasing distance of the lamp?

.....

.....[1]

(d) Suggest why, in a lake, very few water plants grow at depths greater than 20 m.

.....[1]

4 Fig. 4.1 shows water droplets from a nozzle falling on a plant. The nozzle gives each droplet a positive charge.

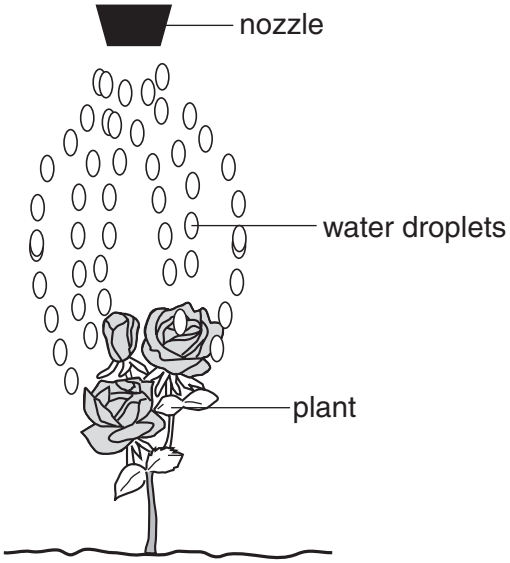


Fig. 4.1

(a) Explain why the droplets spread out as they leave the nozzle.

.....

.....

.....[2]

(b) The plant gains a negative charge. Explain why this makes the water droplets move towards the plant.

.....

.....[1]

(c) Every 20 seconds, 5.0×10^7 water droplets come out of the nozzle. Each droplet carries a charge of 1.8×10^{-11} C.

Calculate

(i) the charge carried away by the droplets in 20 s,

[1]

(ii) the charge carried away by the droplets in 1.0 s,

[1]

(iii) the electric current from the nozzle.

[1]

5 Fig. 5.1 shows the apparatus used to investigate the composition of air.

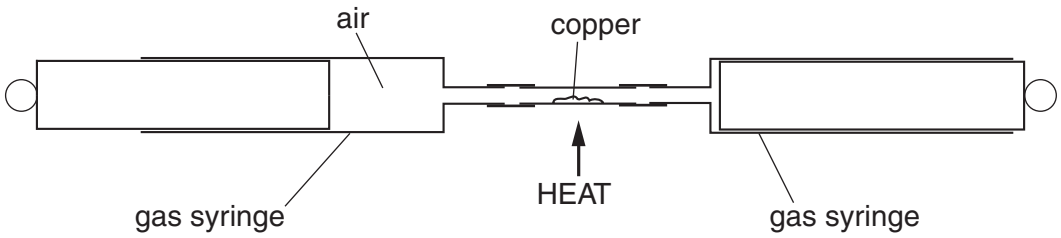


Fig. 5.1

Air is passed over hot copper from one syringe to the other. One of the gases of the air, **X**, reacts with the copper, which changes colour from brown to black.

The results obtained from the experiment are as follows:
initial volume of air in the syringe = 75.0 cm^3
final volume of gas in the syringe = 60.0 cm^3

(a) Name the gas **X**.

.....[1]

(b) **(i)** What is the volume of gas **X** in the sample of air?

..... cm^3 [1]

(ii) Calculate the percentage by volume of gas **X** in the air.

.....

.....[2]

(c) Air contains about 1% of argon.

(i) In which group of the Periodic Table is argon?

.....

(ii) Suggest why argon does not react with the copper.

.....[2]

6 **(a)** State the function of red blood cells.

.....[1]

(b) **(i)** State two structural adaptations of human red blood cells that help them to carry out their function.

1 .....

2 .....[2]

(ii) Explain how **one** of the adaptations you stated in **(b)(i)** helps the cell to function.

.....

.....[1]

(c) Fig. 6.1 below shows a blood smear seen under a microscope.

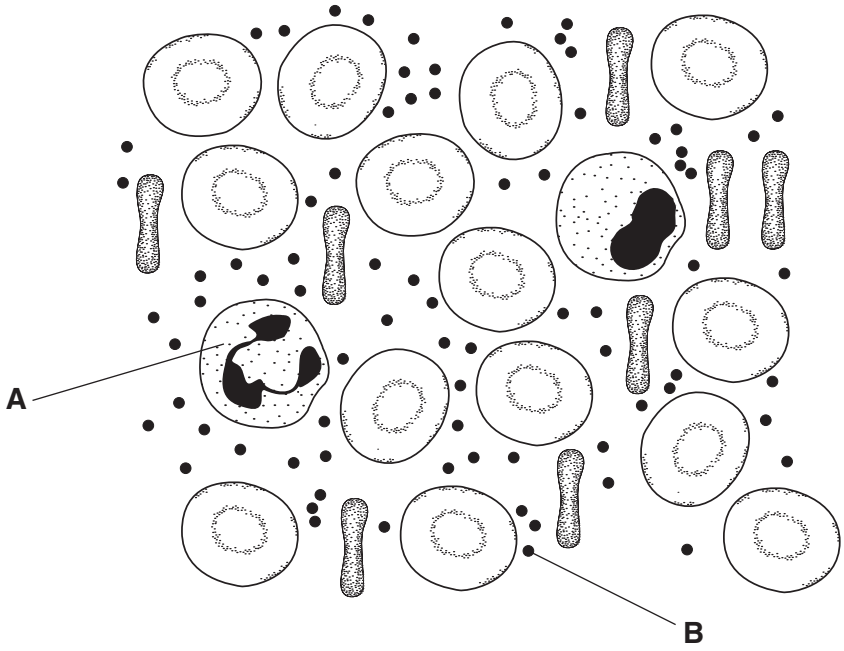


Fig. 6.1

(i) Name **A** and **B**.

A .....

B .....[2]

(ii) State the functions of **A** and **B**.

A .....

B .....[2]

7 **(a)** Complete the following sentences about energy changes in a hydroelectric power station.

In a hydroelectric power station, water flows downhill. As it falls, the ..... energy of the water is changed into ..... energy. In the generators, ... energy is changed into ..... energy. Friction causes some energy to be wasted as ..... . [3]

(b) One generator produces 72 000 000 J of energy in 12 minutes.

(i) State an equation for calculating power.

.....[1]

(ii) Calculate the power of the generator.

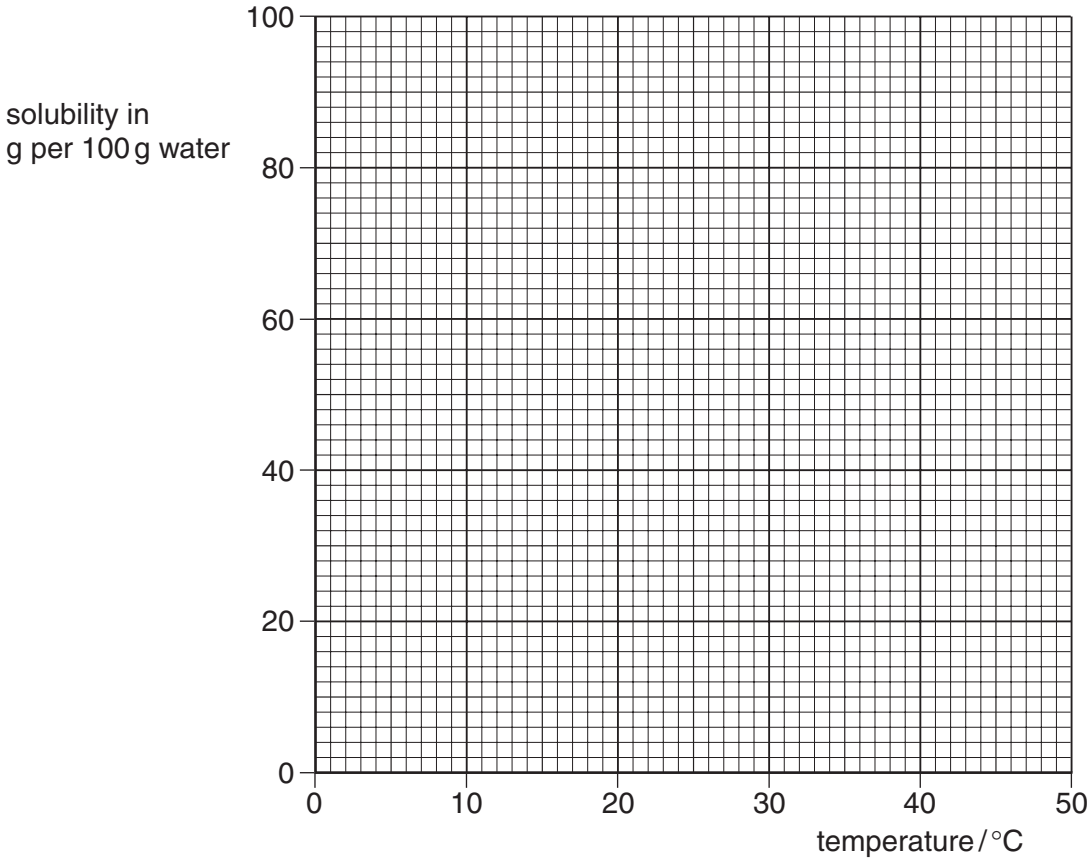
[2]

8 Fig. 8.1 shows the solubility of ammonia in water at different temperatures.

temperature / °C	0	10	20	30	40	50
solubility of ammonia / g per 100 g water	90	69	53	41	31	24

Fig. 8.1

(a) On the grid below, plot a graph of solubility against temperature.



[2]

(b) Use the graph to find the solubility of ammonia at 25 °C.

..... g per 100 g water. [1]

(c) When ammonia solution is heated, ammonia gas is given off.

(i) What is the maximum mass of ammonia that can be dissolved in 100 g of water at 20 °C?

..... g [1]

(ii) If this solution is heated to 40 °C, what mass of ammonia gas will be given off?

..... g [1]

(iii) If 17 g of ammonia has a volume of 24 dm^3, what is the volume of the gas given off in **(c)(ii)**?

.....

.....[1]

9 **(a)** Explain what is meant by *excretion*.

.....

.....

.....[2]

(b) **(i)** Name the organ through which carbon dioxide is excreted.

.....[1]

(ii) Name the process that produces this carbon dioxide.

.....[1]

(iii) Where in the body does the process in **(b)(ii)** take place?

.....[1]

(c) Fig. 9.1 is a diagram of a kidney and its blood vessels.

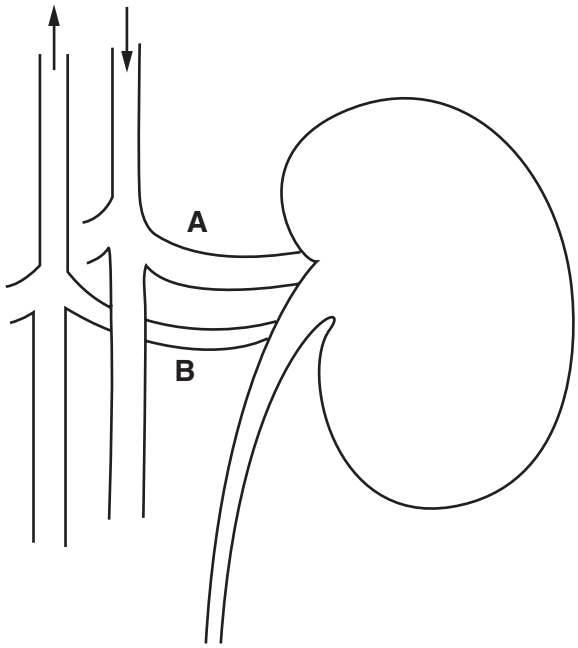


Fig. 9.1

Suggest three differences between the blood in artery **A** and the blood in vein **B**.

1 .....

.....

2 .....

.....

3 .....

.....[3]

10 Fig. 10.1 shows a ray of light, **A**, passing through a glass block and a ray **B** arriving at point **X**.

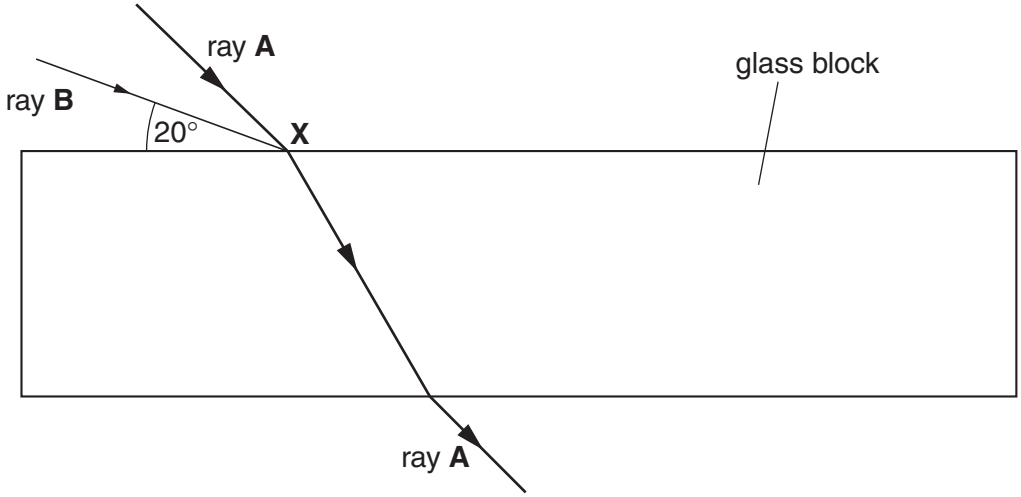


Fig. 10.1

(a) On Fig. 10.1, draw ray **B** passing through and out of the block. [3]

(b) What is the angle of incidence of ray **B** at point **X**?

.....[1]

(c) **(i)** State an equation for calculating refractive index.

.....[1]

(ii) When the angle of incidence is 54°, the angle of refraction is 35°.

Calculate the refractive index of the glass.

[2]

11 Ethanol is made by the fermentation of glucose.

(a) Describe the essential conditions for the fermentation of glucose to form ethanol.

.....

.....

.....

.....[4]

(b) Balance the equation for the fermentation of glucose.

$C_6H_{12}O_6 \longrightarrow$ ..... C_2H_5OH + ... CO_2 [1]

(c) State **one** industrial use of ethanol.

.....[1]

12 Breathing in smoke from burning coal, oil, wood or cigarettes can damage the lungs.

Name two air pollutants, other than carbon monoxide, that are harmful to the lungs.

For each one, explain the way in which the lungs are affected.

1 pollutant .....[1]

effect .....

.....[1]

2 pollutant .....[1]

effect .....

.....[1]

13 Wires in a mains cable are different colours.

(a) State the colour or colours of

(i) the live wire, ...

(ii) the neutral wire, ...

(iii) the earth wire. .....

[3]

(b) Which wire should be connected to the fuse? .....[1]

(c) A plug is connected to a kettle. The element of the kettle is rated at 2.0 kW, 230 V

(i) Calculate the current in the element of the kettle.

[2]

(ii) Three fuse ratings are available. These are 5 A, 10 A and 15 A.

State which fuse rating is most suitable for the plug of the kettle.

.....[1]

14 Butane is a fuel obtained from petroleum (crude oil). It is used as a fuel because it burns in air giving a large amount of energy.

(a) Name the process used to obtain butane from petroleum.

.....[1]

(b) Butane belongs to a homologous series of hydrocarbons.

(i) Name this homologous series. .....[1]

(ii) State **two** characteristics of a homologous series.

.....

.....

.....[2]

(c) What type of bonding is present in a molecule of butane?

.....[1]

15 **(a)** A woman starts to menstruate on November 1st.

(i) On which day does she expect to ovulate?

.....[1]

(ii) She does not become pregnant.

On which day does she expect to begin menstruation again?

.....[1]

(iii) The days of the following month, December, are listed

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

.....

write the word *fertile* under the days when an egg is most likely to be fertilised. [1]

(b) Complete the following sentence by choosing words from the list below.

Each word may be used **once**, **more than once** or **not at all**

fetus **ovary** **sperm** **uterus** **zygote**

An egg fuses with a ..... to form a ..... which develops into a ball of cells that implants in the wall of the ..... , where it grows into a ..... . [4]

16 The following is a list of substances.

ammonium sulphate **calcium carbonate** **chlorine**

copper **nitric acid** **sulphur dioxide**

Use the list to answer the questions. Each substance may be used **once**, **more than once** or **not at all**.

Name the substance that

(a) reacts with ammonia to produce a fertiliser, ...[1]

(b) reacts with dilute sulphuric acid to produce a colourless gas, ...[1]

(c) is used to control the acidity of soil, ...[1]

(d) forms a covalent compound when reacted with hydrogen, ...[1]

(e) forms an alloy when mixed with zinc. .....[1]

DATA SHEET
The Periodic Table of the Elements

Group																
I	II										III	IV	V	VI	VII	0
							1 H Hydrogen 1									4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †														

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).